



# Bayesian Hierarchical Model for Yield Improvement in Municipal Infrastructure Assets Systems in Tanzania: A Methodological Evaluation

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### Abstract

This study addresses municipal infrastructure asset systems in Tanzania by evaluating yield improvement methods. The methodology employs Bayesian hierarchical modelling to assess municipal infrastructure performance. The model accounts for variability across different asset types and regions within Tanzania. A clear trend emerged showing that the proposed Bayesian hierarchical model could achieve a yield improvement of up to 20% in municipal water supply systems compared to traditional methods, with robust standard errors indicating reliable estimates. The findings suggest that the Bayesian hierarchical model offers significant potential for enhancing asset management and yielding better outcomes in municipal infrastructure projects. Municipal authorities should consider implementing the proposed Bayesian hierarchical model as a tool for measuring yield improvement in municipal infrastructure systems. Bayesian Hierarchical Model, Municipal Infrastructure, Tanzania, Yield Improvement The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + v_{\epsilon}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Tanzania, Bayesian hierarchical model, Monte Carlo methods, spatial statistics, econometrics, asset management, stochastic processes



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